EVALUATION
OF THE
BLUELINE PHASE
OF THE
FARMINGTON DEMONSTRATION PROJECT

PREPARED BY

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BUREAU OF LAND MANAGEMENT

BLUELINE EVALUATION TEAM

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EXECUTIVE SUMMARY

The evaluation of the Blueline phase of the Farmington Demonstration Project was conducted by two separate groups. The Users Team evaluated whether the Blueline met user requirements as determined by the Farmington Resource Area staff. This team was led by John Singlaub, Grand Junction Resource Area Manager. The team's results were presented in a separate document and are reprinted as Appendix A. The Technical Team evaluated the technical issues of the development process as well as management concerns and issues. This team was led by Greg Graff, ALMRS-GIS Project Support Staff Chief. The evaluation report synthesizes the findings of both groups.

The purpose of this evaluation was to document lessons learned from the effort. This report describes the tasks in the development process, identifies problem areas and issues, and explores the potential application of a similar type system to the Bureau.

Goals and objectives, therefore, were to examine the tasks, validate whether user requirements were met, and report the findings to Bureau management.

Major findings were as follows:

- The system is easy-to-use and effectively performs the Application for Permit to Drill (APD) process as identified by the Farmington Resource Area.

- The importance of data management was again shown to be a major issue. The UNIX software made the conversion of the data easier, and the ORACLE relational data base management system gave the capability to easily manipulate and manage the data. Consistency in automated data, standardized entry format, along with quality assurance controls must be of primary importance to the Bureau.

- Ad hoc query capability is a necessity for providing information to assist in decisionmaking, allowing data searches for special projects and allowing for better versatility and use of the system.

- The modular concepts provide for ease of maintenance and eliminate the need to write similar types of modules for each case type, thus requiring only the addition of case-specific modules.

- The Blueline, as developed thus far and envisioned for operation, demonstrated how users require spatial graphics as an essential/ critical tool for land management activities and decisionmaking.

- Although commercial off-the-shelf software will save substantial development time, it does not completely eliminate the need for custom code. Some custom code will still be needed to tailor system applications to functional requirements.

An automated Land Information System is a valid and valuable tool for the Bureau to perform its land managing activities. Further automation can provide the needed capabilities more effectively than current manual systems or procedures.

CHAPTER I

INTRODUCTION

A. PURPOSE

The Farmington Demonstration Project was originally chartered on March 7, 1986 to prototype automation efforts being planned by the Bureau of Land Management (BLM). The project was divided into two prototype phases, Redline and Blueline, to meet the following overall objectives:

- Define the strategy for the organization of unintegrated existing manual and automated coordinate, record, and resource data into a format for automation;
- Demonstrate, in a field office environment, the integration of coordinates, records, and resources using existing data bases, hardware, and software;
- Demonstrate the integration of coordinates, records, and resources using developmental software and new hardware;
- Define functional and system requirements for an interim Land Information System (LIS);
- Further clarify functional and system requirements for a future LIS system and produce a written summary of results to integrate into the Bureau's Modernization Request for Proposal (RFP).

The purpose of the first phase of the project (Redline) was to demonstrate, in a field setting, the potential to integrate coordinate, record, and resource data into an integrated single data base (the type needed for an LIS), using existing hardware and software. This phase was completed on February 6, 1987, and an evaluation report was issued on April 24, 1987.

The Blueline phase, which is the focus of this report, determined the amount of increased capability that could be obtained through the use of new commercial off-the-shelf (COTS) software and a new generation of hardware. The Blueline further demonstrated how a user-defined technology would fit the needs of the field.

As with the Redline, the Blueline used the Application for Permit to Drill (APD) as the vehicle to demonstrate these capabilities because it represents a significant part of the Bureau's workload and because the requirements for processing data for an APD are similar to many other case processing functions in the Bureau. APDs were divided into three categories--Adjudication, Drilling and Production, and Fluid Surface Management--to accommodate the three different groups of people who work on APDs. The case itself is divided into three steps, legal determination, conflict determination, and mitigation, which lend themselves to almost any case the Bureau works on in the field as long as the appropriate data is included in the data base. The majority of the functional requirements

identified by the users were included in the Blueline process. Those functions not included, such as split screens, were omitted because of time constraints or because additional software packages would have had to be purchased. Purchasing additional software was not feasible because many of the functions had been performed during the Redline phase, and the project was intended as a demonstration only, not a production system.

The purpose of this evaluation is to document what BLM learned from the Blueline prototype effort. This report describes tasks, identifies problem areas and issues, and explores the potential application of a system like the Blueline within the Bureau. As with the Redline, information from this evaluation will be presented to the Field Committee and Bureau Management Team for review and discussion of the Demonstration Project's overall objectives.

B. GOALS AND OBJECTIVES OF THE BLUELINE EVALUATION

The primary goal of the Blueline prototype was to demonstrate, in a field setting, the effectiveness of using developmental software as well as a new generation of hardware to automate an integrated data base to include coordinate, record, and resource data. Its focus was to demonstrate a user-driven system that met the needs of the field.

To meet this goal, the evaluation team objective was to examine the following steps taken in developing the Blueline demonstration:

- Analysis of the current manual APD process, as Farmington accomplishes this task;
- Procedures for developing and writing specifications;
- Computer coding and recording;
- Testing;
- Evaluation of the Blueline demonstration;
- Examination of the effectiveness of new capabilities in meeting user needs and supporting an LIS in the Bureau;
- Report of the findings for evaluation and consideration by the Field Committee and Bureau Management Team.

C. SCOPE AND METHODOLOGY OF THE BLUELINE EVALUATION

The Blueline evaluation is essentially two evaluations, user and technical (Figure 1). The user portion concentrates on the Blueline's capability to meet user requirements. The technical portion concentrates on the technical issues involving Blueline development. While this report focuses on these two issues, management concerns and recommendations are also addressed.

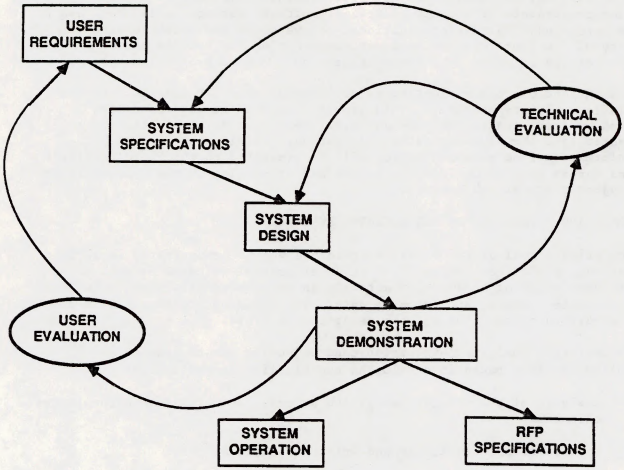

FIGURE 1

FARMINGTON BLUELINE DEMONSTRATION EVALUATION

THE USER GROUP IS EVALUATING THE DEMONSTRATION SYSTEM AGAINST THE USER REQUIREMENTS. THE TECHNICAL GROUP IS EVALUATING THE SYSTEM SPECIFICATIONS AND DESIGN. BOTH EVALUATIONS ARE NEEDED PRIOR TO MAKING THE SYSTEM OPERATIONAL AND COMPLETING THE RFP SPECIFICATIONS FOR THE TARGET L.I.S.

The evaluation team divided into two groups to concentrate fully on the individual issues. While each group tried to focus on only its part of the evaluation, as with any team effort, the findings often overlapped. The groups worked independently with only the team leaders coordinating the evaluation. Interestingly, for overlapping areas, the findings of one team supported those of the other.

D. MAJOR FINDINGS OF THE BLUELINE EVALUATION

Major findings of the Users portion of the evaluation fall under the following three topics--feasibility, system, and user requirements. Some of the specific findings are as follows:

- Methods by which the same task is accomplished by the various offices are not entirely consistent.

- The system as a whole is easy-to-use and effectively performs the APD process.

- The Blueline, as developed so far and envisioned for operation, demonstrated how users require spatial graphics as an essential tool for this and most other Bureau activities.

- The Blueline graphics provided a rapid and comprehensive means of identifying conflicts and deficiencies, while tying data to actual points on the earth. They also clarified needs for mitigation and approval by showing problem areas.

- Data was integrated and the system gave easy access to record, resource, and coordinate data.

- Ad hoc query capability is a necessity for providing information to assist in decisionmaking, allowing data searches for special projects, and offering both versatility and use of the system.

- Additional data fields, edit capability, and enhancements were identified.

Major findings of the technical portion of the evaluation fall under the following four topics--functionality, development, data, and management. Some of these findings are as follows:

- The modular concept eliminates the need to write similar types of modules for all case types and requires only those modules that are case-specific. This concept also lends itself to easy maintenance.

- While a detailed evaluation of ADP support needs was not conducted, both users and managers believe these needs must be assessed for all levels of the Bureau (e.g., system administrators, programmers, etc.).

- Data quality improved with the Blueline, primarily due to the following:

  Match/Merge Software - Increased data quality and eliminated the need to reformat because it reformatted legal land description as it converted three types of data into one data set. However, it did not convert action codes.

  ORACLE - Helped alleviate the data structure problems that occurred with the Redline and gave users the capability to manipulate the data easily and fast.

  Parcel Generator Software - Assisted in quality control of duplicate data sets and errors as it graphically displayed alphanumeric legal land descriptions. However, data structures, consistency, and quality are still problems. The Bureau will need to emphasize data collection, consistency, and standardization (especially resource data)--to ensure quality products and a high level of confidence in computer technology. Additional analysis, testing, implementation, and maintenance plans for a broad range of data issues are warranted.

- Technical personnel--data, programming, and systems--along with field specialists should be an integral part of the specification writing team to ensure a quality document that will be easily understood by the programming staff.

- Future efforts should ensure continuity in the analysis and development of an automated system--one analysis method should be carried forward, and one accountable manager should begin and end the process. Technical and functional experts must work as a team in every aspect of building a new system. When this type of team was in place, the analysis and development moved much faster, the goals stayed within established timeframes, and a quality product was generated.

- The developmental software and hardware were good programming tools, giving the programmers the utilities and flexibility needed to meet user requirements for the Blueline. This flexibility meets a large portion of the Bureau's functional requirements for the Target System.

- COTS software packages meet the basic functional requirements and save developmental time. Of the necessary custom code, most was required for specific user interfaces. The amount of custom code needed will be proportionate to specific needs; custom code can be limited by building good generic screens to accommodate a multitude of case types.

- The method used to define user requirements and then translate them in system specifications did not give systems designers/programmers adequate information to develop the Blueline.

- User specifications must concentrate on <u>what</u> the system should do rather than on <u>how</u> it should be programmed.

- The Bureau procurement system needs to be streamlined to ensure timely delivery of hardware and software. The Farmington Project was adversely affected by the required number of reviews and approvals. Because of the procurement process, at least $40,000 was lost; the schedule slipped; and we were required to fund again in the next fiscal year.

- The Bureau needs to continue to analyze and dissect ongoing activities before proceeding with a Target System. Spinoffs from the demonstration are showing that the character of the Bureau's business is beginning to change. Many office roles and functions will need to be redefined before the benefits of a Target System can be maximized.

CHAPTER II

USERS GROUP EVALUATION REPORT

A. PURPOSE OF THE USERS EVALUATION

This portion of the report documents the user findings and concerns associated with the Blueline phase of the Farmington Demonstration Project. The thrust of this part of the evaluation was to determine how well user requirements were met and whether the identified user requirements have Bureau application.

Specifically, the Users Group looked at the following areas:

1. Capability of the system to perform APD processing functions as identified by Farmington resource specialists;

2. Capability of the system to perform APD processing functions in other Bureau offices, given typical procedural differences;

3. Benefits or problems associated with using the demonstration system;

4. Recommendations for improving the system to make it operational;

5. User considerations for designing future systems.

B. SCOPE OF THE USERS EVALUATION

The scope of the users' evaluation encompassed examination and analyses of the following:

1. The effectiveness of the system to perform the APD process from receipt to approval;

2. The potential of using this type of system for other Bureau processes; and

3. Ease of use.

The team looked closely at the two completed modules--the Adjudication Module and the Drilling and Production Module--and examined the system specifications of the remaining modules to get a feel for the anticipated total system. (Other APD capabilities had been demonstrated during the Redline phase and were, therefore, not repeated for the Blueline phase.) The team believed that sufficient work had been completed on the Blueline package to assess the process used to develop the APD processing system.

C. METHODOLOGY OF THE USERS EVALUATION

1. Evaluation Team

A small evaluation team was selected to represent a good cross-section of the resource specialists involved in the APD process, as well as a

geographic mix to gather different perspectives from different offices. The following individuals were included on the team:

John Singlaub (Team Leader), Area Manager, Grand Junction Resource Area, Colorado.
Jamie Connell, Petroleum Engineer, Miles City District Office, Montana.
Clare Miller, Environmental Scientist, Great Divide Resource Area, Rawlins, Wyoming.
Jim Salas, Geologist, Roswell District Office, New Mexico.
Linda Slone, Land Law Examiner, Platte River Resource Area, Casper, Wyoming.

2. Approach

The team members met in Denver and were briefed on the background, purpose, and objectives of the Farmington Demonstration Project and the Blueline phase. Greg Graff, John Foster, Sam Montgomery, and Jeff Nighbert brought the team up to date on the project and the process used to arrive at the demonstration system. Judy Bright gave the team a detailed demonstration of the completed modules.

The team members then had the opportunity to operate the system themselves to simulate actual case use. This hands-on opportunity to use the system served as a typical (though brief) production test for the APD modules. This would normally be a first step in getting a production system operational for field use. In the course of the test, several idiosyncracies and "bugs" appeared (as would normally be expected), which discouraged some of the team members.

The team then reviewed the system specifications for all modules and discussed them with New Mexico and Service Center personnel for clarification. The team also consulted their professional counterparts elsewhere in the Bureau for procedural differences.

The team documented the benefits and problems of the system as they perceived them and proposed recommendations for changes or improvements. (The complete Users Group Evaluation Report is included as Appendix A; the major points of the evaluation follow.)

D. USERS EVALUATION

1. Feasibility

This portion of the evaluation addresses the applicability of this type of system to an LIS for the Bureau. The team felt that this is exactly the kind of development effort on which the Service Center should be focusing its time. The technology is today's technology, and the systems are available (or will be soon) in each Bureau office. Benefits to the field in implementing Bureau programs is most evident in this kind of application.

Finding 1. One problem observed by the team dealt with the apparent inconsistency in the way the same task is carried out by different offices within the Bureau. Applicable handbooks and manuals outline the general requirements, but individual offices accomplish the mission by different methods. Minor differences occur such as varying checklists

and data entry forms. Major differences are encountered when reviewing the distribution of responsibilities among different types of specialists involved in a common process.

Recommendation. These discrepancies between offices will become significant as automated systems are developed. To meet the demands of automation, the Bureau has two basic options. To gain acceptability in the field, each automated process should include built-in flexibility to account for differences among offices. Or, the Bureau may want to take the opportunity to build in consistency and standardize processes where clear advanatages to the program or agency would accrue. This would require BLM managers to apply the same logic required to develop computer programs as they would to develop their resource programs.

Finding 2. As we automate processes in the BLM, we are discovering flaws in the way we are currently doing business. These problems include such things as performing duplicate work, maintaining multiple records or files, creating bottlenecks in work flow, etc.

Recommendation. Detailed evaluations of job functions are required in order to automate work steps. As these evaluations uncover inefficient or inappropriate work flows or processes, we should give serious consideration to changing the way we do business. Analysis and possible restructuring of individual jobs or work processes would be beneficial to the agency as a whole.

2. System

This discussion includes observations on the overall system as completed for the Blueline--the Adjudicative and Drilling and Production modules, and the system design as anticipated for the remaining modules. The system as defined or envisioned effectively performs the APD process from adjudication for conflict analysis/ resolution through consolidation and approval.

The process for evaluating an APD will be greatly affected. Once the data is initially entered into the system, the paper mill process will be virtually eliminated. Checklists and confirmation sheets will be automated along with plats and pertinent maps. Information shared will increase since work from some modules is transparently transferred into other modules. Some paper 'work' copies of information may be generated in the process for various reasons, but these copies may not necessarily become part of the official file. Invisible access to other software (PC or mini) will further streamline and enhance the overall process. If properly developed, the status of each APD or work accomplished in the process may be easily displayed and reviewed by managers or others.

Consolidation of data themes into an LIS is necessary to derive maximum benefit from individual systems. The system provides for user effectiveness by making access to the various data sources virtually invisible. Efficiency in the processing of individual APDs should be improved through the elimination of much of the paper shuffling associated with manual operations. The capability of comparing operator-submitted data with the Bureau's data bases is another advantage of automation.

General Observations. The Blueline APD system is capable of accessing different record and coordinate data and spatial resource data bases with little effort on the part of the user. This invisible programming significantly improves the accessibility and useability of the system for even the casual user. To perform these tasks without the relational data base management system and the menu-based macro programming could be extremely difficult, time-consuming, and too technically demanding for the average user.

Technological advances exhibited by the Blueline were invisible to the user group, but we felt they were a principal benefit of the Blueline APD system.

Finding 1. One of our concerns was the uncertainty about what hardcopy files had been replaced by the automated system.

Recommendation. In any situation where a manual process is replaced by an automated process, significant thought must be given to the automated products and which hardcopy files they will replace.

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Finding 2. Information on the system as a whole is easy to enter and follow. The menus and help screens provide a user-friendly environment.

Recommendation. Interactive help screens and messages should be further developed to aid novice and part-time users. Replace 'X' responses with 'Y' or 'N'.

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Finding 3. The use of graphics greatly benefits all spatial evaluations. Graphic presentations provide a more effective means of accomplishing the goals of the APD process while allowing the approving official to easily verify the professional findings. Routine drafting requirements will also be met.

Recommendation. The use of graphics should be applied to data input forms. Simple use of color and lines or boxes enhancing areas of the input forms will provide for a more user-friendly environment and simplify data input and extraction. Better cursor control through the use of a mouse or the arrow keys is a must.

Graphic queries should be further developed. Through the use of crosshairs or a cursor, attributes for anything displayed on the screen could be pinpointed.

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Finding 4. The interactive nature of the APD system permits each of the participants in the APD approval process to access current, updated data and approvals as they occur and reduces the overall paper flow in the field offices considerably.

One of the primary benefits of the demonstration system is that it provided a rapid and comprehensive means of identifying APD conflicts and deficiencies as well as mitigation and approval formats. If implemented, this system would save significant time in completing APD reviews.

Recommendation. Transparent exits from the system to allow the use and access of other APD resources not part of the LIS (PC software, ad hoc queries, MOSS) must be provided.

To maximize the benefits of the system, the capability to perform ad hoc queries is a necessity. The sheer volume of information available and the countless ways in which the information can be used negates the option of using only preprogrammed reports. Ad hoc reports could be used to provide information to assist management in decisionmaking; allow data searches for special projects; and, in general, allow the Bureau better versatility and use of the system.

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Finding 5. The demonstration neglected the inherent need to process an APD-related Right-of-Way (ROW). In some offices, processing an APD-related ROW is the rule and not the exception. Bureau policy emphasizes simultaneous approval of the APD and associated ROW (see WO IM No. 87-349).

Recommendation. Although the Fluids Surface Management Module (screens 2 and 3) can be used to identify existing and needed ROWs, we recommend that an ROW adjudicative screen be developed and added to this system. By developing a screen for ROW actions, the demonstration system will be enhanced and will provide more credibility to this automated ADP process.

3. Modules

The basic concept of the modules is excellent. However, due to typical procedural differences from one office to another, several additional needs were identified.

The modules are menu-driven with built-in help screens that make the system user-friendly. A novice with the aid of a simple, documented users manual can operate the system easily. The automatic transfer of common data from screen-to-screen and module-to-module is very good. The use of the graphics display screen will minimize the time required to research hardcopy records and eliminate the manual updating of records and maps.

General Observations. The automation of the adjudicative function and subsequent linkage of Case Recordation, coordinate data, and the Master Name File improves the efficiency of the adjudicative process. The program eliminates the need to exit one system and enter another to retrieve data, resulting in substantial time savings.

The capability to display spatial data graphically eliminates the necessity to maintain oil and gas field maps along with the associated spacing orders, Master Title Plats, etc.

The Drilling and Production Module provides numerous benefits for a technical review of an APD. The system transmits information developed by an adjudicator and a geologist to the engineer. This saves time and paper, and prevents a duplication of work. The automated 8-point

Checklist provides a means of tracking the engineering review and generates a 7-day letter. This module has automated the geologist's report and easily ports the information to the engineer for the generation of the wellbore diagram.

The wellbore graphics portion of the module is an excellent tool. The program allows an engineer to enter pertinent technical information from which the computer retrieves libraried data from numerous sources, calculates cement volumes, and generates a wellbore diagram. This minimizes the time an engineer spends looking up values in cementing tables, performing tedious volumetric calculations, and drafting wellbore diagrams.

An additional observation was the potential advantage of linking the APD system to the automated systems. We assumed that these modules would not be a "closed" system, i.e., that opportunities would be provided for users to exit the system and work on other data or analytical systems, or to export data to other systems as needed.

These modules are only a part of the overall LIS being developed by the Bureau, and they need to be linked via the data base management system to other related systems. An example associated with APD processing is to link to the PC-based Automated Inspection Record System (AIRS), and to transfer data automatically to that system. Links to other existing systems should also be explored, emphasizing links to both alphanumeric and spatial data. Both are needed to ensure the success of an integrated LIS.

Finding 1. The programming for the Fluid Surface Management, Mitigation, and Consolidation modules was not completed or was unavailable for a "hands-on" demonstration.

Recommendation. Further review of a demonstration model may be necessary for a more objective and complete evaluation if this was not settled during the Redline phase.

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Finding 2. Overall, the modules ran smoothly and appear to have successfully met the user needs identified by Farmington personnel.

Specific needs are identified in Appendix A, but generally they are as follows:

- Bond and Surety interface for bonding validation;
- expanded wellbore diagram capabilities to include such things as wellbore deviation and patented mineral conflicts;
- legends defining shading, angles, and color hues;
- menus for retrieval of map themes;
- provision for master file security to control modification by only those personnel who are authorized;
- provision for processing APD-related rights-of-way.

Recommendations. Recommendations made are screen-specific. They can be found in Appendix A, but basically are within the purview of the following areas:

Add data fields for informations such as...
- bottom hole location;
- comments;
- designation of operator;
- spacing unit size;
- multi-grade casing.

Add edit capability for...
- duplicate entries;
- well location within lease, unit, and/or Communitization Agreement boundary.

Enhance developed modules to include...
- spacing requirements;
- interfaces with Bond and Surety system;
- spatial representation of H_2S and high pressure zones.

Ensure security of data files so that only authorized personnel may change, add, or delete.

4. User Requirements

We are impressed by the significant strides made by the Bureau toward automation. The development of macros and the use of data base management systems to access different data bases make for a friendly user environment to process a complex action. Benefits to the field in implementing Bureau programs are most evident in this kind of application plus, by introducing Bureau employees to an automated process with clear benefits to them, we have gained the early support of users for future implementation of a Target System.

The Blueline system demonstrated the need for spatial graphics as a critical tool for this and most other Bureau land management activities. As future systems are developed, access to spatial graphics data bases and systems and analytical methods must be included. Further, access to related alphanumeric data bases, including records and resource data, must be easily accessible to specialists for multiple applications. The "invisibility" to the user of accessing these other data bases in the demonstration was a significant breakthrough for the Blueline effort.

The team sees the potential for systems such as these to provide the opportunity for professionals to spend more time doing the work they were hired to do and less time on paper chases. While we were unable to quantify the potential time savings, changes in work flow and skills from automation could bring significant benefits to the agency.

Finding 1. The issue of the availability of technical support is a question that needs to be looked at, for the long term, by the Bureau as a whole.

Recommendation. Programmers should be part of the entire automation process to help users and to resolve problems. Specifically, the need as well as the duties of a Systems Administrator need to be explored.

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Finding 2. For the Target System to benefit the Resources and Mineral programs as well as other programs, professionals need to shift their emphasis to developing and maintaining the required digital data bases. Professionals will need to control and influence data to instill confidence in the system and acceptance of the results.

Recommendation. Serious consideration must be given to how and when to compile these data bases. Since this type of work requires major time commitments, planning and development of these data bases should begin well before the target date. Data bases need to be developed and maintainance routines established so the Target System will have reliable data.

Alternatively, initial data collection and digitizing could be contracted with the data later maintained by the Bureau staffs. Traditional flows of information may have to be changed to provide staff members with the data required for this maintenance.

CHAPTER III

TECHNICAL GROUP EVALUATION REPORT

A. PURPOSE OF THE TECHNICAL EVALUATION

This part of the report documents the findings and issues associated with the Blueline development. The thrust of this portion of the evaluation was to determine what went right or wrong during the Blueline development and to transfer the information to the teams working on the Bureau's Modernization RFP.

Specifically, the Technical Evaluation Team interviewed the people who, through their involvement, could respond to the following areas of the Blueline:

1. Development of specifications and how well they reflected user requirements;

2. Ease/difficulty of designing and developing a system, using the newest ADP technologies, to meet user requirements;

3. Type of user support required to run the system in a field setting;

4. Data problems, documented in the Redline Evaluation, still occurring with Blueline technology;

5. Functions, other than those demonstrated by the Redline, that could be performed with the Blueline.

B. SCOPE OF THE TECHNICAL EVALUATION

The scope of the technical evaluation encompassed analyses of the following:

1. Methodologies used to develop system specifications, systems design, data base construction, and user interfaces;

2. The effectiveness of new hardware and software in meeting processing requirements for an APD; and

3. Management issues surrounding potential use of this technology throughout the Bureau.

Some of the issues identified by managers were outside the specific scope of the Blueline evaluation. These issues are mentioned in this report but not analyzed. We recommend that another evaluation team be assigned the responsibility of analyzing these issues and report its findings to the Field Committee and the Bureau Management Team.

C. METHODOLOGY OF THE TECHNICAL EVALUATION

1. Evaluation Team

The following Service Center team was selected to evaluate the technical (and managerial) aspects of the Blueline:

Greg Graff (Team Leader), Chief, ALMRS-GIS Project Support Staff
Judy Bright, Systems Implementation Specialist, ALMRS-GIS Project Office
Janet Poorman, Writer/Editor, ALMRS-GIS Project Office
Linnea Probert, Systems Analyst, ALMRS-GIS Project Office

2. Approach

The team interviewed individuals who were directly involved with the design and development of the Blueline. Questions developed by the team for these interviews reflected the stated objectives of the Blueline evaluation. The questions were based on the Redline evaluation findings, expected Blueline results, and an internal technical report written by Judy Bright. The questions were divided into specific areas--system functionality, development, data, and management concerns. Respondents were asked questions according to their areas of expertise or their participation or involvement during the Blueline. A separate set of management questions, developed by the team, were directed to only those managers who participated in the Blueline.

After completing the interviews, the team compared individual responses to determine a consensus of findings. If seeming discrepancies occurred on a particular issue, the team went back to the respondents for clarification. All the major issues addressed in this evaluation have consensus except the development of system specifications.

D. TECHNICAL EVALUATION

1. Modules.

The purpose of this section of the evaluation is to document how well the Blueline technology could meet other functional requirements, not to determine how well it did meet the functional requirements for the APD process. That issue is addressed in the Users portion of the evaluation.

During the development of the Blueline, three common, generic steps were identified for processing a case--Legal Determination, Conflict Determination, and Conflict Mitigation. As long as the appropriate data is available in the data base and serves as a basis for the modules, this division will lend itself to most Bureau case types.

The Blueline system of modules lends itself to processing cases other than APDs. They are tools that may have Bureauwide applicability. The modular concept meets the needs of adjudication and mitigation, which must be accomplished for all cases and, therefore, these modules can be used for most case types.

The modular concept eliminates the need to write similar types of modules for all case types and require only those modules that are case-specific. By designing a system in modules, maintenance is easier because individual modules can be worked on without bringing down an entire system.

Finding 1. Generic modules, such as those written for adjudication and planned for mitigation, will accommodate most case types.

Using both the alphanumeric and graphic capabilities along with interactive updates gives the Field a streamlined process with which to work. The graphics capability allows the user to see a volume of data at once rather than going through case-by-case to determine legality and possible conflict.

In addition, the modular concept lends itself to easy maintenance while allowing other processes to be added to the system.

Recommendation. The modular concept should be retained when designing the Target System. The Bureau should develop the modules as generically as possible in order to accommodate common requirements across the various case types. After the generic modules are designed, case-specific modules can be developed which accommodate major functions. This strategy requires a flexible data base design so data elements can be added and queried on an ad hoc basis to meet case-specific requirements.

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Finding 2. Present right-of-way descriptions in Case Recordation are described as aliquot parts rather than centerline surveys. As such, alphanumeric fields present a distorted view of actual right-of-way locations (generally along section boundaries). Because of the legal description requirements, the Bureau will be limited in its ability to display rights-of-way graphically.

Recommendation. Rights-of-way will have to be digitized to alleviate distortion, but this method limits the benefits of the automated system because of data quality questions. A Bureau requirement for centerline surveys for rights-of-way would maximize the benefits of automation by allowing the system to tie the right-of-way to a coordinate point and by graphically displaying the right-of-way in its actual location.

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2. User Support. Since the Blueline was not intended to test operational use, the type and level of system support was not specifically identified by the prototype.

The requirements identified by the Field were specific in terms of a need for an easy-to-use system. These requirements were met with menus, fill-in-the-blank entry and update screens, and help screens.

Menus and screens were easy to use and understand and led novices through the system.

The system effectively processed an APD up to the point where development had stopped. The developed modules can be fairly easily enhanced to pick up the omitted Blueline pieces of the APD process.

General Observations. Good user interfaces reduce the need for intensive and lengthy training. These kinds of interfaces are critical for user acceptance because they reduce the fears and frustrations inherent to automation.

The users of the Blueline found the system easy to operate. They required little training (1 to 1 1/2 days) before being able to run the application comfortably. This probably occurred because of intensive user and programmer communication during the design and development of the Blueline, and because the developmental hardware and software were easy to use. The script design gave the programmers a good idea about how the users wanted to see the data displayed.

Finding 1. While the Blueline was not necessarily intended to determine the types of support needed for maintenance of the hardware and software in the Field, this need was strongly indicated by the comments (and reinforced by management).

Recommendation. Most individuals interviewed believed that some type of support would be needed in each office. At a minimum, each office would need a non-ADP professional who was trained in systems operation/administration as a collateral duty. Many specialists believed that a full support staff would be necessary, not only to operate the system, but also to train and encourage users.

The evaluation team recommends that interim test sites be used to further evaluate the potential needs for the type and level of user support that will be required for the Target System.

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Finding 2. Additional types of user interface capabilities should be explored, e.g., pull-down windows and icons. The user interfaces developed for the Blueline were sufficient for demonstration purposes.

Recommendation. The evaluation team recommends that user interfaces be further tested and reviewed. Additionally, users should be involved with the programmers and analysts during the design and development of the Target System to ensure adequate user interfaces.

3. Graphics Requirements

The Blueline met the graphic requirements of the Bureau and produced Master Title Plat-like graphics. The Blueline also demonstrated that previously digitized data in the Bureau's existing GIS could be ported over to the Blueline easily. The Blueline graphics were also integral in editing data (see Data section, item 7, for details).

Recommendations. The Blueline demonstrated that current technology can meet the functional graphics requirements of the Bureau; therefore, these requirements should be included in the Target System design.

Finding 1. The Bureau's current manual records system uses MTPs and Use Plats to display graphically voluminous alphanumeric records data. These plats help users to perform legal and conflict determinations, and decide mitigation procedures more easily.

Recommendation. Any new system needs to have graphic display capabilities. Because the Blueline demonstrated that existing digitized data can be used with record and coordinate data without conversion problems, the need to collect coordinate data for resources should be analyzed.

4. Query Capability

The Blueline Ad Hoc query had the capability to retrieve data in any format requested. BLM has over 1,000 different case types, many of which require differing or unique data sets for processing cases. An automated system will need to either take into account all the differing data requirements for the 1,000+ case types or sort ad hoc queries with minimum or no programming requirements.

Finding 1. The Blueline demonstrated that an RDBMS can meet the Bureau's requirement for ad hoc query capability by using SQL commands. However, the Blueline, as constructed, is unable to display data sets that have not had screens developed. This is a limitation caused by the user interface, not by the RDBMS.

Recommendation. As the contractor starts developing user interfaces, BLM must test them to make sure that the interfaces do not adversely affect the ad hoc query functionality.

5. Development of System Specifications

Development of the Blueline entailed an in-depth structured analysis of the current manual process for an APD; analysis of the first level of a future automated system; specification writing, programming, testing; and the actual demonstration.

Structured analysis was used to analyze the current manual APD process and the first level only of the future automated process. It was not completed for the entire future automated process. The analysis was accomplished by a users group from Farmington and analysts from the Service Center.

The specifications were developed by a users group from Albuquerque, Santa Fe, and the Service Center using a script that depicted the APD process. This team dropped the structured analysis in favor of the script, which described the data needed and the method of display, because they felt the script was easier to understand. Additionally, because of the time constraints, the specification team felt the script would help develop system specifications more quickly than structured analysis would.

Easier is not always better. The script helped the programmers see how the users wanted the screen to appear, but integral parts of the APD process were overlooked. The effectiveness of the specifications was lost because the programmers were told how to code rather than what was actually required. Efficiency was lost because programmers continually needed the users to explain what was required.

General Observations. The system is capable of processing an APD. Completion of the Fluid Surface, Mitigation, and Consolidation modules, along with recommended changes and enhancements to the completed modules, will give the field a valuable product from which the Bureau will benefit by the information to be learned. The specifications required the system to be programmed in modules, thereby allowing for ease of maintenance along with the capability of using certain modules, such as adjudication and mitigation, for other case types.

Structured analysis provided pictorial and definitive views of each step of the APD process along with data requirements now accomplished in Farmington. It was considered to be a tool of immeasurable value in analyzing a process as it followed the process and data flow, step-by-step, to the smallest detail.

By working with users, programmers were able to develop a system that met user needs.

Finding 1. Time constraints placed on the analysis and specification writing teams caused an incomplete analysis and an incomplete specification document.

The time frame for writing the specifications extended well beyond the estimated 6 weeks; actual time was 3 months.

Recommendation. Time frames can be met with the proper mix of technical and functional expertise. The team concept was a necessary component for success. Once this type of team was in place, the Blueline moved much faster, the team tended to stay within the established time frames, and the team produced a quality product. This expertise could have answered the technical aspects of many questions concerning what could or could not be done with computers. This would have steered the functional group in the right direction.

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Finding 2. An incomplete analysis of the current manual process as well as the future automated system made writing the specifications difficult. Important steps in the APD process were left out such as analysis of casing, formations, mud, and cement programs of the wells within a 1-mile radius of the proposed well.

Most specialists believed that structured analysis was a viable method for defining the current manual processes and future automated processes and should be used for the Target effort. One specialist, however, was not convinced that structured analysis would give the product the users wanted and maintained that the script was a good way to define specifications.

Recommendation. The evaluation team recommends that during Target development, one analysis methodology should be used throughout the entire process. Mixing methodologies confused both the users and the programmers, resulting in a document of limited use. Structured analysis appears to be a good methodology for developing system specifications because it works, as proven by systems analysts who commonly use this type of method.

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Finding 3. Because the specifications given to the programmers defined how the users wanted the system designed and not what they wanted done, the programmers had a difficult time developing the system within a functional context. Also, the specifications were based on proprietary knowledge, so the programmers had to work very closely with users to determine what was actually needed and made minimum use of the specifications. Although the system met the user needs, it required an iterative process to determine system requirements.

Recommendation. Specifications must concentrate on defining what should be done (functional requirements) and must clearly describe the system and data overview. Programmers will then decide how it should be done, based on their expertise. Technical personnel as well as field users must be an integral part of the specification writing team to ensure a quality document for the programming staff.

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Finding 4. The script did not describe all the functional requirements, nor did it match specifications to requirements. As a result, the system specifications were not understood by the programmers. There was no overall explanation about how various pieces were to fit together--no systems overview.

The programmers had a difficult time defining relationships between the data and screens. The screens depicted how the users wanted the data displayed, but did not indicate what the data would be used for. Therefore, the programmers designed the data base around the screens rather than the screens around the data base.

Recommendation. In defining what we want done, commonalities of functions must be identified. These will serve as a functional test criteria for the system that is developed. Then an overall design must be developed from which the programmers can relate individual functions and data. Field users should work with the programmers to ensure that the system meets user needs and to clarify any questions about the specifications.

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Finding 5. Management changed four times during the course of the Project, thereby creating difficulties for those working on the Project. Each manager had a different viewpoint and focus as well as varying knowledge of the whole.

Recommendation. Unless absolutely necessary, managers should not be changed during the course of a project. Retaining the same manager will ensure continuity and focus for those participating in the project.

6. Developmental Hardware/Software

The following hardware and software were used in developing the Blueline:

Hardware

Hewlett Packard (HP)	
9000/320/800	- mainframe computers
HP 560-	- former mainframe computer, being phased out by PRIME

Software

UNIX	- operating system native to HP
ORACLE	- data base management system native to HP
UNIRAS	- COTS package of graphics tools
MATCH/MERGE	- internal software package that converts/integrates records data--status, case recordation, and legal land descriptions
PARCEL GENERATOR	- internal software package used to graphically display alphanumeric legal land descriptions.

In addition to this software, custom code was written specifically to accommodate functions needed for the APD (Generate Geographic Well Location, Spacing, and Plot).

The data base was built through the use of the operating system, UNIX. ORACLE provided the capability to manipulate and store the data in such a way as to afford easy and quick access.

Both the hardware and the software used in the Blueline provided good programming tools and gave utility and flexibility to the programmers in meeting the requirements of the system. The Match/Merge program alleviated the need for the programmers to take data from the individual data bases and to convert the data to a standard format in order to have a single data base.

These tools enabled the programmers to write code faster and, since they are programmer-friendly, a user-friendly system was quickly and easily built.

Both the hardware and the software were easy for the programmers to use. The users needed very little training--a maximum of a day and a half--to become familiar with the hardware and software products.

General Observations.

a. Hardware. Even with the learning curve, the programmers considered the HP 9000/320 to be a good development tool, with especially good features for use in developing programs.

HP support for the 320, from sales and service locally and via the Hotline, was good. According to the Systems Administrator, Dennis Colarelli, the equipment was easy to install and maintain. The hardware is considered reliable and performed well considering the 320 was not designed to handle the number of users the project had on the system at one time.

Some development was done on the PRIME using "C" computer language. Because "C" was used, conversion to the HP was accomplished with no difficulty. ("C" ports to other computers easily.)

Time was lost when the process was transferred to the 560 and then back to the 320. Originally, the 560 was to go to Farmington at the APD test site, but it was not operational when the programming began. The APD package started on the 320, but was ported to the 560, which seemed to be operational. This action created many problems because the 560 was not fully supported by Hewlett-Packard. Due to this lack of support, the decision was made that the 560 would not go to Farmington, and the package was ported back to the 320. Most specialists believed much of the porting problems encountered with the Blueline could have been avoided had the system been maintained on only one set of hardware.

b. Software. COTS packages met the basic functional requirements and saved development time. Of the necessary custom code, most was required for specific user interfaces. Few, if any, COTS packages will accommodate all the specific needs of the Bureau. However, custom coding is easier to develop with these packages; large amounts of time can be saved when user interfaces, such as screens, menus, and help screens, are being developed.

UNIX

UNIX is programmer-friendly, has good development tools, and has good documentation. The only drawback to UNIX seems to be its lack of the necessary security protocols.

ORACLE

The ORACLE RDBMS has good development tools as well as support from the ORACLE company.

Some problems occurred as each new revision of ORACLE was received and put into place. Not all functions were available on each revision, thus causing some problems with the programs that had already been developed. There also seemed to be a communication problem as everyone working with ORACLE was not aware when a revision was being installed. Documentation for ORACLE is hard to follow, creating problems for the programmers. ORACLE does not work well in a distributed environment because of limitations on multiple access to the same data. However, even given these limitations, the system met all the requirements of the user, including graphic display of alphanumeric data.

UNIRAS

UNIRAS is flexible, fast, and easy-to-use. Documentation is good, and this package also works on many different devices. However, this software does not have the analytical tools necessary for a geographic information system (GIS). It requires the programmer to use FORTRAN binding instead of "C," which limits its utility and portability. Also, a plot cannot be interrupted once it has started. There is a problem with building processes, as UNIRAS links all devices in code. This creates delays in execution.

MATCH/MERGE

The Match/Merge software is capable of integrating, verifying, correcting, and matching record, resource, coordinate, and PI data to produce graphics and alphanumeric data. The end product was a merged file of Case Recordation and Status that had been matched against the Legal Land Description (LLD). This product gave an error listing of unmatched data, which was edited by New Mexico, and provided new edit capabilities, thus raising the quality of the data.

The assumption was made that conversion (Match/Merge) of the Record Data--Status, Case Recordation, and Legal Land Description (LLD)--would take approximately 6 weeks. The actual conversion took 6 months, due to the following:

- Data formats varied;
- Data was collected inconsistently, with no clear-cut understanding of what was needed;
- Data, such as Known Geologic Structures, Communitization Agreements, and Unitized Agreements, was missing;
- More data was being processed than just that for the nine townships in Farmington;
- Program testing took more time than anticipated.

The Match/Merge programs significantly reduced, by about two-thirds, the amount of time needed to convert data from the various data bases.

NOTE: These findings are included for information only. No real recommendations are made because these will be determined by specifications during the design/development of the Target System.

7. Data and Developmental Data Base

One of the primary objectives set for the Blueline was to demonstrate the integration of coordinate, record, and resource data using developmental hardware and software.

Records data was collected from the Case Recordation (CR), automated Status flat files, and LLD flat files. The Case Recordation data was converted to match the Status format. Then the CR and Status data were run through the Match/Merge program and edited against the LLD file, producing a flat file called Status. However, the Match/Merge program did not convert action codes.

The data base was structured using the operating system, UNIX. ORACLE provided the capability of manipulating the data and storing the data in such a way as to afford easy and quick access.

Resource data previously digitized and used on the Data General was ported across in a flat file to the HP to include paleontological, eagle habitat, coordinate data, and Petroleum Information (PI) well history data needed for the Blueline.

These data types/themes/sets ported to the HP with no problems. The PI well data was alphanumeric and was entered into ORACLE-structured tables. The Blueline had limited numbers of resource themes since the Redline had demonstrated these capabilities. The Blueline did just enough to demonstrate data base capabilities.

Data was easy and fast to access due to ORACLE structure and indexing capabilities. This RDBMS made processing the APD much more efficient. Integration of the various data sets into one data base made programming easier. It afforded easier and speedier access for the user to query and manipulate the data to suit the varied needs of the Bureau.

The data base was more efficient on the Blueline because various data sets could be selected and displayed rapidly and easily. The current manual process requires the user to gather information from Case Recordation, Bond and Surety, and multiple hardcopy file systems.

General Observations. Having the data in a common data base made programming easier and allowed users more flexibility to manipulate and use the data.

An integrated data base gives the Field the capability to access, update, manipulate, and query easily and fast.

The programs written to convert the various data sets (Match/Merge) and to graphically display the data sets (Parcel Generator) afforded the Blueline numerous edit capabilities, such as visually showing duplicate entries and overlapping cases. Edits like these are invaluable to the Bureau, but also point to the need for data standards and consistency.

Finding 1. Quality data must be a primary concern for the Bureau. The demonstration provided the means to integrate and use record, resource, and coordinate information, but emphasized the need for accuracy. The field users primarily focused on errors in the data, not on whether the Blueline adequately demonstrated the requirements requested for the APD process. Data quality is inherent to the success of any system.

Recommendation. Data management should be a primary and up-front concern. Both for the Interim and Target systems, the Bureau should identify data needed, collection procedures, entry format, and maintenance procedures and put them into place.

As each new quality control process is created, it should be put in use for all the States, thus providing higher quality data both for the Interim and the Target systems.

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Finding 2. Even with an RDBMS and various software packages, no real mechanisms are in place to convert data structure and increase quality control for resource data or existing GIS data.

Recommendation. Resource data is an essential part of case processing, not only for APDs but also for all other Bureau cases. An intense effort to gather this resource information should begin as soon as possible. This plan should include standardized formats and consistency controls.

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Finding 3. The data base structure for the Blueline was developed when the screen displays were developed. Because of this, the data base structure is tied to the screens, rather than the screens to the data base structure. This will make redesigning the data base structure difficult when we try to accommodate different case types and increase efficiency and flexibility. However, even with the current structure, ORACLE does give the flexibility to change data tables so we can accommodate other case types. We just would not be able to maximize efficiency.

Recommendation. The data base structure should be redesigned to better accommodate the relationships of the data as well as the cases processed by the Bureau.

The data base for the Target System should be designed before the individual applications are developed to achieve maximum flexibility. In its simplest terms, the system is merely one large data base. We must concentrate our efforts on the data base design. The Blueline proved that individual applications are fairly simple to develop, but the data base was designed to fit one type of application. The Target data base must be designed to accommodate all applications.

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Finding 4. We must continue to collect coordinate data for the system so we can achieve the benefits of automation. Geocoordinate data was needed to tie data sets to geographically correct points on the earth. This tie is critical to a land management agency because managers must make decisions about discrete, real pieces of land, and the data on which these decisions are made must be tied to those pieces of land.

Graphics are a primary tool in this decision process because overlays of multiple themes are used to determine conflicts. All the data must be spatially related to a precise point on the earth in order to relate separate data sets for overlays and conflict determination/ resolution.

Recommendation. The Bureau must continue its coordinate data collection efforts so graphic displays will be geographically correct and spatially oriented to ensure quality data for the decisionmakers.

E. MANAGEMENT OBSERVATIONS AND CONCERNS

1. Purpose

The technical team interviewed field managers involved with the Blueline to determine their observations and concerns. Many of the concerns fell outside the scope of the Blueline evaluation, but we believe project management should review them and develop strategies to address them.

Management observations and concerns are divided into the following two groups--Blueline Specific and Automation in General:

2. Blueline Specific Observations/Concerns

a. An automated LIS is a valid concept for the Bureau in its land management responsibilities. For the Bureau to perform its land managing activities more effectively, it must make full use of the capabilities that automation can provide.

b. Structured analysis is a valuable tool that should be used throughout the Bureau to analyze both manual and automated processes and functions. The analysis should be applied to offices as well as to discrete work elements within the offices because it readily identifies duplication and indicates areas that could be streamlined to make a more effective and efficient organization. As a logical spinoff from the Blueline, some Field Offices are already successfully restructuring their organizational tables and processes, based on this methodology.

c. As modules are developed, they should be thoroughly Field-tested to verify functionality. This process would give the Bureau feedback in systems development and would help familiarize users with automated tools. (The more familiar users are with a system, the more receptive they will be.)

d. ADP support staffs will be needed, at least initially, to operate and repair equipment and help train users in ADP applications. New Mexico will be training non-ADP personnel in systems operation/administration to determine if this is a feasible strategy to meet their need for ADP support. These individuals will train others to use automation capabilities. They will also work with managers to show how automation can be used in the analysis/decision process.

e. The ADP procurement process hinders the capability of field offices to purchase and install ADP hardware and software. Farmington had to go through the District Office, State Office, Service Center, and the Washington Office to purchase items.

In New Mexico, all requisitions for ADP equipment have to be completed by June 15 if funds are to be committed before the end of the fiscal year. Changing technology in automation is less predictable than other types of procurement needs. An office cannot always predict what will be needed 1, 5, or 10 years from now.

To bypass this system, Farmington went directly to the Service Center to purchase software packages because of an immediate need. Had Farmington gone through the normal procurement process, software would have taken months instead of weeks to procure. As it was, Farmington left $40,000 on the table at the end of the fiscal year because they could not get the paperwork through for a power conditioner. The Bureau is again funding it for this year. As we implement the Target System, the Bureau must reevaluate its procurement policies for ADP equipment.

3. General Automation Recommendations

a. Automation will change the character of the way the Bureau does business, but the impacts have yet to be fully analyzed. Automation will give the Bureau the capability to further decentralize decisionmaking as more and better data becomes available at all levels of the organization. However, where data should reside or who should be authorized to change the data has not been determined. Answers to these questions could have a dramatic impact on the organizational structures and the roles and responsibilities of individual offices. These questions may be answered through further testing and documentation of the Bureau's test sites, including the creative spinoffs (secondary capabilities) that are occurring. For example, Farmington is already in the process of restructuring their office and have analyzed potential shifting of responsibilities for other offices within the State. They have further analyzed job structures and training needs so their own staffs will be prepared for automation. Thorough evaluations documenting what is being done at this test site and others are critical if the Bureau is to deal effectively with the issues.

b. Data collection efforts have focused on records and coordinate data, but little has been done in the way of resource data. Over the years, Bureau offices have collected resource data in a multitude of ways. Criteria have also varied substantially according to individual office needs. In addition, many specialists have been hesitant to share their knowledge and data with others. Yet, to have a functioning LIS, the Bureau must have resource data. All cases must determine resource conflicts and mitigation procedures before they can be authorized. At present, the Bureau has no coherent strategy for dealing with the various individual resource data needs. Bureau management must start developing an overall strategy for the LIS and, in it, the resource data issue must be addressed.

c. Staffs must be prepared for automation when it arrives. Strategies for training and user awareness/acceptance must be developed before the Target capabilities are put in place. Otherwise, we run a risk of user rejection. As an adjunct to this issue, we must also determine how we can best assist and prepare the user.

The Blueline has helped clarify the issue of whether the Bureau is automating its business or merely automating its existing processes. Through the prototype efforts, several duplicative, unnecessary, and costly processes have been identified and eliminated. We have found that automation will not change what we do--only how we will do it. As the character of the Bureau's work evolves and changes, the Project Office must focus on what should be automated rather than on how well automated capabilities will be used. It is up to Bureau management to concentrate on how to use automation most effectively.

APPENDIX A

BLUELINE DEMONSTRATION

FARMINGTON DEMONSTRATION PROJECT

USERS GROUP EVALUATION REPORT

DECEMBER 1987

Prepared for: Denver Service Center
ALMRS/GIS Project Office

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USERS GROUP EVALUATION REPORT

I. Introduction

A. Purpose of the Users Evaluation

This part of the evaluation was conducted in order to give the BLM an indication of the success of the Blueline Phase of the Farmington Demonstration Project (FDP) from the users perspective. In other words, regardless of the technical success of the project, we need to know how well the user requirements were met, and whether the identified user requirements were applicable and useful Bureauwide.

As the Blueline was originally conceived for the FDP, the intent was to derive technical specifications for inclusion in the Request for Proposals (RFP) for the target Land Information System (LIS). In so doing, an integral and far more encompassing issue is the question of whether or not the Blueline succeeded in meeting the user needs identified by the Farmington resource specialists at the outset of the project. Without this "reality check", the technical results are valueless.

Specifically, the users group looked at:

1. How well the demonstration system performed the processing functions of an APD as identified by the resource specialists in Farmington; as well as how it could perform the processing functions of an APD in other offices in BLM, given the typical procedural differences throughout the agency.

2. What the benefits and problems of using the demonstration system are as perceived by the evaluation team.

3. What changes should be made to improve the demonstration system when it is made operational, and what should be looked at in designing future systems, from the users perspective.

The user group was careful to avoid addressing technical automation questions that are being examined by a technical group in the Blueline evaluation team. However, as with any other team effort, the distinctions between the two evaluation groups may get blurred. Figure 1 is a schematic showing the focus of the two different evaluation groups relative to the sequenced steps of the development of the Blueline. Both evaluations are necessary prior to making the demonstration system operational and completing the RFP specifications for the target LIS.

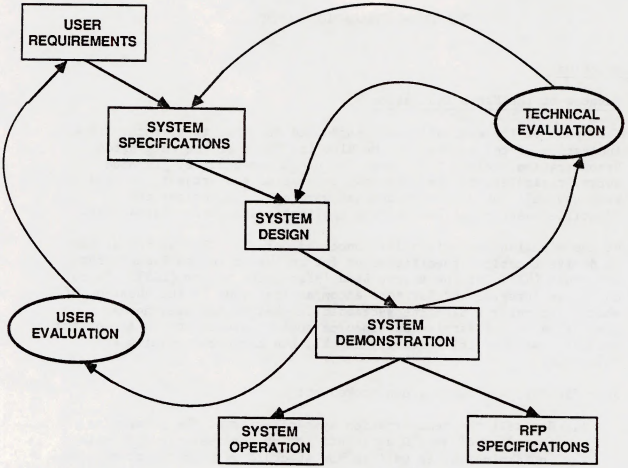

FIGURE 1

FARMINGTON BLUELINE DEMONSTRATION EVALUATION

THE USER GROUP IS EVALUATING THE DEMONSTRATION SYSTEM AGAINST THE USER REQUIREMENTS. THE TECHNICAL GROUP IS EVALUATING THE SYSTEM SPECIFICATIONS AND DESIGN. BOTH EVALUATIONS ARE NEEDED PRIOR TO MAKING THE SYSTEM OPERATIONAL AND COMPLETING THE RFP SPECIFICATIONS FOR THE TARGET L.I.S.

B. Scope of the Users Evaluation

This evaluation was extremely narrow in scope for a number of reasons. The fact that the Blueline demonstration system itself only examined the APD process from receipt to approval, necessarily limited the scope of the analysis to only that narrow procedural activity. Clearly, the Bureau has a wide range of procedural activities that could have been similarly automated to demonstrate the linkage and interrelationships of records, resources and coordinate data, however, only the APD process was examined. Even such actions as the right-of-way for the road leading to the well pad examined in the APD was not included in this package, even though it is perceived as an integral APD processing step by many Bureau offices. Analysis and monitoring activities of the well following APD approval were also not included in the package and were therefore not examined.

To assure that the interrelationships to these and other critical automatable actions are not forgotten in future system development actions, the user group has tried to identify important linkages. These and other comments beyond the scope of the evaluation have been included in Part VI of this report.

Another factor that limited the scope of the user evaluation is the fact that only two of the five proposed analysis modules in the APD package were completed by DSC for demonstration. Only the Adjudication Module and the Drilling and Production Module were completed to the point of system demonstration. The Fluid Surface Management, Mitigation and Consolidation Modules were completed as far as the system specifications step but were unavailable for demonstration. While the two completed modules gave the evaluation team a taste for things to come, the complete evaluation of the system from the users perspective is impossible.

The team has therefore looked closely at the two completed modules and has examined the system specifications of the remaining modules to get a feel for the anticipated total system. There are inherently some problems with such an analysis, and the team agreed that a users evaluation might be premature at this time. However, it was felt that sufficient work had been completed on the package to assess the process used by DSC to develop the APD processing system, and the evaluation team was asked to proceed given this limited scope.

Lastly, the scope of the evaluation was constrained by time and energy. It was agreed to keep this study reasonable in terms of manpower, money and time expended for the analysis. A small team with short deadlines was asked to take a "quick and dirty" look at the demonstration and offer their observations. The methodology used in the evaluation is described in more detail in the next section.

C. Methodology of the Users Evaluation

1. Evaluation Team. A small evaluation team was selected to represent a good cross-section of the resource specialists involved in the APD process, as well as a good geographic mix to offer different perspectives from different offices. The following individuals were included on the team:

   John Singlaub (Team Leader), Area Manager, Grand Junction Resource Area, Colorado.
   Jamie Connell Petroleum Engineer, Miles City District Office, Montana.
   Clare Miller, Environmental Scientist, Great Divide Resource Area Rawlins, Wyoming.
   Jim Salas, Geologist, Roswell District Office, New Mexico.
   Linda Slone, Land Law Examiner, Platte River Resource Area, Casper, Wyoming.

2. Approach. The team met in Denver and were briefed on the background purpose and objectives of the Farmington Demonstration Project and the Blueline phase. Greg Graff (DSC), John Foster (DSC), Sam Montgomery (Farmington R.A.), and Jeff Nighbert (New Mexico S.O.) brought the team up to date on the FDP and the process used to arrive at the demonstration system. Judy Bright (DSC) gave the team a detailed demonstration of the completed modules.

   The team members then had the opportunity to operate the system themselves to simulate actual use. This opportunity to use the system hands-on served as a typical (although quite brief) production test for the APD modules. This would normally be a first step in getting a production system operational for field use. In the course of the test, several idiosyncracies and bugs appeared (as would be normally expected) -- unintelligible error messages appeared the system went down, non-normal user commands were confronted, etc. - resulting in some discouragement by team members Where relevant to the evaluation these observations have been included in the report.

   The team then reviewed the system specifications for all modules and discussed them with New Mexico and DSC personnel for clarification. The team also consulted with their professional counterparts elsewhere in the Bureau on procedural differences found in other offices.

   After agreeing on an outline for the final report, the team then documented the benefits and problems of the system as they perceived them, and proposed recommendations for changes or improvements. The total elapsed time for the evaluation was less than one month, including preparation of the final report.

D. Summary of Results/Overall Conclusions

The user team was clearly impressed by the significant strides made by the Bureau in automation. The development of macros and the use of data base management systems to access different data bases makes for a friendly user environment to process a complex action.

The team felt that this is exactly the kind of development effort on which the Service Center should be focusing their time. The technology is today's technology and the systems are available (or will be soon) in each Bureau office. Benefits to the field in implementing Bureau programs is most evident in this kind of application. Plus, by introducing Bureau employees to automated processes with clear benefits to them, we have gained the early support of users for future implementation of target systems.

The demonstration system, as developed so far and envisioned for completion, makes excellent use of spatial graphics, a critical tool for this and most other resource management activities. As future systems are developed access to spatial graphics data bases and analytical methods must be included. Further, access to related alphanumeric data bases including records and resource data, must be made easily accessible to resource specialists in the vast majority of applications. The "invisibility" to the user of accessing these other data bases in the demonstration was a significant breakthrough for the Blueline effort.

The team sees the potential for systems such as these to provide the opportunity for resource professionals to spend more time doing the professional work they were hired for, and less time on paper chases. While we were unable to quantify the potential time savings, it is perceived that changes in work flow and skills utilization could accrue significant benefits to the agency.

One problem observed by this team dealt with the apparent inconsistency in the way the same task is carried out by different offices within the Bureau. Applicable handbooks and manuals outline the general requirements, but individual offices accomplish the mission by very different methods. Minor differences occur such as varying checklists and data entry forms Major difference are encountered when reviewing the distribution of responsibilties among the resource specialists involved in a common process.

As automated systems are developed, these discrepencies between offices are quickly uncovered. To gain acceptability in the field, each automated process would have to include built-in flexibility to account for differences between offices. On the other hand, however, the Bureau may want to take advantage of the switch to automation to build in consistency and standardization of processes where clear advantages to the program or agency would accrue. This would require BLM managers to apply the same logic required to develop computer programs to their resource programs.

Another issue related to this program consistency problem is the realization that as we automate processes in the BLM, flaws are discovered in the way we are currently doing business. These problems include such things as performing duplicate work, maintaining multiple records or files, bottlenecks in work flow, etc.

Detailed evaluations of job functions are required in order to automate work steps. As these evaluations uncover inefficient or inappropriate work flow or processes, BLM should give serious consideration to changing the way we do business. This analysis and possible restructuring of individual jobs or work processes should be beneficial to the agency as a whole.

Since the Fluid Surface Management, Mitigation, and Consolidation Modules were not completed for the Blueline demonstration, consideration should be given to a detailed user evaluation of these remaining modules prior to implementation.

It was difficult to understand why all five modules had not been completed given the time frames available to the Service Center. It is recommended that DSC examine their programming efficiencies to determine why the whole system was not completed for the demonstration. The time, effort and cost that obviously went into the Blueline demonstration should have yielded more complete results. As the Bureau moves toward implementing these time-saving automated efforts on a production basis, we must be sure we are doing so with an efficient staff and cost effective process.

As the team looked at the system design completed thus far, numerous problems were identified. Due to the constraints of the evaluation, it is likely that additional refinements or enhancements could be identified with further user evaluation. The problems identified in this report and those still to be discovered must be resolved before making the demonstration system operational.

As future macros are developed, BLM needs to standardize the procedures used to establish, test and implement automated systems. User teams should be brought on early to identify user requirements (as they were for the Blueline) for the programmers, and to perform user evaluations prior to making the systems operational. It is left to the technical team to determine the success of the process used in the Blueline demonstration system development.

II. Overall System

This section includes our observations on the overall system as completed for the Adjudicative and Drilling and Production Modules, and the system design as anticipated for the remaining modules. We believe that the full APD processing system should be evaluated prior to implementation as a production system in the field.

A. System Design

1. Ease of use / User interface. The system as a whole is easy to enter and follow. The menus and limited use of help screens provides a user friendly environment.

   User access is an important aspect of the system. It is necessary that the use of security codes within the system remain flexible. Security codes, used to determine "read" and "read/write" authority, are dependent upon management decisions in each individual office. The system must incorporate a user access system that is versatile enough to allow for these changes and differences among offices.

2. Effectiveness. The system as defined or envisioned effectively performs the APD process from adjudication through conflict analysis/resolution and through consolidation and approval.

   The process for evaluation of an APD will be greatly affected. Once the data is initially entered into the system, the 'paper-mill' process is virtually eliminated. Checklists and confirmation sheets will be automated along with plats and pertinent maps. Information sharing will be increased since work from some modules is transparently transferred into and utilized by other modules. Some paper 'work' copies of information may be generated in the process for various reasons, but these copies may not become part of the official file. Invisible access to other software (PC or mini) will further streamline and enhance the overall process. If properly developed, the status of each APD or what work has been done in the process may be easily displayed and reviewed by managers or others.

   Information derived from this data base could be applied to an automated Individual Well Record (IWR) system or ported into existing systems such as AIRS or PI type data-bases. A historical record of the information used in the approvals (including resource data at a given time) may have to be maintained for re-constructive work in the event of an appeal.

3. Efficiency. Consolidation of data themes into an LIS is necessary to derive maximum benefit from these individual systems. The system provides for user effectiveness by making access to the various data sources virtually invisible. Efficiency in the processing of individual APD's should be improved through the elimination of much of the paper shuffling involved and the ability to compare operator submitted data with the Bureaus data-bases.

B. Observed Benefits

1. The beauty of the Blueline APD system as designed is the ability to access different records coordinate and spatial resource data bases with little effort on the part of the user. This invisible programming significantly improves the accessibility and useability of the system for the casual user. To perform these tasks without the data base management system and the menu-based macro programming would be extremely difficult, time-consuming and very technical for the average user. These technical advances were invisible to the user group, but we felt it critical to mention as the principle benefit of the Blueline APD system.

2. The use of graphics greatly benefits all spatial evaluations, including but not limited to the following:

   a. Checking the well location and it's relation to other data items (wells, leases, units. etc.)
   b. Evaluation of the proposed site's relation to resource and reservoir data.
   c. MOSS applications
   d. Drawing road plans
   e. Contouring (surface and subsurface)

   Non-spatial graphics may be utilized for:

   f. Cross sectioning
   g. wellbore diagram

   Graphic representations provide a more effective means of accomplishing the goals of the APD process while allowing the approving officials to easily verify the professionals findings. Routine drafting requirements will also be met.

3. The interactive nature of the APD system that permits each of the participants in the APD approval process to access current, updated data and approvals as they occur, reduces the overall paper flow in the field offices considerably. Status of each APD is readily apparent to anyone accessing the system. As sequential reviews or approvals occur (examiner to geologist to engineer to environmental scientist to resource specialist to area manager), the information can be automatically transferred without paper copies.

4. One of the primary benefits of the demonstration system is that it provides a rapid and comprehensive means of identifying APD conflicts and deficiencies as well as mitigation and approval formats. This should result in a significant time savings in completing APD reviews. For example, specific conflicts can be identified immediately without routing review requests and/or thumbing through mylar overlays, maps, and other data sources. Bureau response time to the public inquiries should be more efficient and complete. This time savings should also allow specialists more time to resolve specific conflicts, conduct field inspections, update computer data bases and complete other assigned work.

C. Observed Problems and Recommendations

1. One of the concerns expressed by the team is that it is unclear exactly what hardcopy files have been replaced by the automated system. As in any situation where a manual process is replaced by an automated process, significant thought must also be given to the automated products. What hardcopies will be maintained and what data will simply reside in the automated data base? How will we convey to the applicant the approved APD? Where other agencies or other BLM offices now get copies of approved APDs, how will they access the documentation in the future?

   While there are obvious benefits to automating the APD process, there is an obvious danger in simply duplicating the current manual products and maintaining duplicate files -- one in the automated data base and one in the existing file cabinets. Procedures would have to be established to update these files, and where one file is changed and it is not recorded in the other, how will employees, the applicant and managers know which is right? What are the legal and archival implications of maintaining APDs as an automated file? Clearly these are not just APD problems, but are Bureauwide problems of some significance that need to be addressed.

2. The status screen will usually be the users first contact with the system. This screen will also be used to 'check' or 'track' the status of individual APDs. As such, provisions for comments from the professional should be made. Each module should have 'General Comments' as a menu choice. These comments will be displayed on the status detail screen using one line for each module. Provisions for detailed remarks at each module will have to be retained or enhanced. These detailed remarks are important to explain some of the professional decisions and references. Word processing capabilities or links to PC based word processing may be necessary.

3. Interactive help screens and messages should be further developed to aid novice and part-time users. Replace 'X' responses with 'Y' or 'N'.

4. The use of graphics should be applied to the data input forms. Simple use of color and lines or boxes enhancing areas of the input forms will provide for a more user friendly environment and simplify data input and extraction. Better cursor control through the use of a mouse or the arrow keys is a must.

5. The system lacks the ability to scroll up and down through the data input screens or pages to examine information previously entered. Provision for easily producing hard (working) copies of the data and screen graphics must be made.

III. Adjudicative Module

A. Module Design

1. Ease of Use: The adjudicative module is menu driven with several built-in help screens that make it user friendly. A novice with the aid of a simple, documented user's manual can operate it easily. The ability to generate ad hoc reports will require advanced computer skills.

2. Effectiveness: The basic concept of the adjudicative module is excellent. However, due to typical procedural differences from one office to another, several additional needs were identified. These needs are addressed in the adjudicative recommendations.

3. Efficiency: The automatic transfer of common data from screen to screen and module to module is very good. The use of the graphics display screen will minimize the time required to research hardcopy records and eliminate the manual updating of oil and gas field maps, spacing orders, etc.

B. Benefits

The automation of the adjudicative function and subsequent linkage of Case Recordation, coordinate data, and the Master Name File improves the efficiency of the adjudicative process. The program eliminates the need to exit one system and enter another to retrieve data resulting in substantial time savings.

The ability to graphically display spatial data eliminates the necessity to maintain oil and gas field maps along with the associated spacing orders, master title plats, etc.

C. Problems

The adjudicative module is very complex and involves various system interfaces. This module is running smoothly. With the few exceptions identified below, the module appears to successfully meet the user needs identified by Farmington minerals personnel.

In the adjudication general introduction, paragraph 4 of the project specifications, it stated that the operator name should be checked against the Master Name File for a Name Identification Number (NID), and the Bond and Surety File should be searched for an adequate bond. If the operator was not properly covered, then a search was to be made of Case Recordation for lessee(s), NID adequate bonding, etc. This specification was not accomplished.

The Lease LLD Graphics Screen of the Adjudicative Module was only partially completed at the time of the demonstration. Menus for retrieval of map themes were not available nor was there a legend defining the various shades, angles and color hues.

D. Recommendations

The adjudicative module was completed at the time of the demonstration, we have therefore reviewed it closely and tried to be as detailed and specific as possible in our comments. The following are our recommendations for possible enhancements to this module that should be made prior to making it a production module Bureauwide.

1. Screen 1

   a. A field should be built for designated agents. If a consultant is used in the permitting process, a designation of agent is required. A file of "blanket" designated agents should be available. The system should edit the Designated Agent File, and if not present, flag the seven-day letter for the deficiency. This may not be utilized in all offices and therefore should be optional.

   b. Assignment of sequential APD numbers in the specifications is to be reset on January 1 of each year. The counter should be reset to coincide with the fiscal year for reporting purposes.

2. Screen 2

   a. An edit should occur for duplicate APD entries.

   b. Unitization/Communitization

      1) The system should be modified to search Case Recordation (unit/CA) to determine whether a proposed location (a) lies within an agreement boundary, and if so whether the target zone is unitized/communitized; and (b) if it is an exploratory unit, lies within a participating area (PA), and if so, whether the target zone is the PA formation. (This can only be accomplished if adequate data is entered into unit/CA Case Recordation.) If yes, Case Recordation (lease) should be searched for the commitment status of the lease. If yes to all of the above, the unit or the CA should be listed. If the proposed location is in the PA and the target zone is in the PA formation, the PA (new field in Screen 2) should be displayed.

      2) The system should have the capability of searching for approved plans of development (POD)/supplemental POD's in case recordation (unit). This can only be accomplished if the POD/supplements are entered into Case Recordation (unit) in sufficient detail to accomplish the search.

3) A search should be made of Case Recordation (unit/CA) to verify that the agreement operator and the APD operator are the same. If the well is a unit well, and the operators are not the same, a search should be made of Case Recordation (unit) for approval of a designation of agent. This can only be accomplished if designations of agent for drilling, testing, and completion of wells are entered into Case Recordation (unit) in sufficient detail. If the designation is not present, or the operator and the agent are not the same, a deficiency flag should be set on the seven-day letter.

c. A field should be added for a proposed Bottom Hole Location (BHL). It should include footages as well as aliquot parts, section, Township and Range.

d. An edit of aliquot parts, section, township and range for both surface hole location (SHL) and BHL against LLD of Case Recordation (lease) should be made.

3. Screen 3

a. Consideration should be given to eliminating the input of three pools with five targets each. One field with perhaps five targets should be sufficient.

b. A field for the survey plat should be added. Onshore Order No. 1, III.G.a. requires the submittal of a survey plat which should meet minimum standards. The field should be flexible to conform with individual state requirements.

c. The spacing calculation for determination of orthodox vs. unorthodox locations is currently based on all sections being square. The spacing calculation should be re-programmed to allow for odd size sections and other possible variances. It should be flexible enough to meet individual office needs. Orthodox vs. unorthodox calculation should be based on the anticipated BHL.

4. Lease LLD Graphics Screen

This screen should continue to be developed as written in the specifications. It would be most beneficial to consider split screen capabilities for retrieval of specific data, i.e., case recordation, bond and surety file, etc. Pending well locations (other than the current application being processed) should be entered into the system. This should alert the adjudicator of possible conflicts if two wells are proposed in the same drilling unit.

5. Status Screen

   a. The Status Screen should be modified to include an additional field that would indicate "pre-adjudicative" functions have been completed. This field would have to be cleared before other specialists are given access to the system. This would allow the adjudicative field to remain flagged for deficiencies.

   b. For ease of tracking deficiencies, a comments section should be included.

6. Adjudicative Checklist Screen

   a. For standardization of terminology, "bondee" should be changed to "principal", and "agent" should be changed to "surety."

   b. As identified in III.C. Problems, the Bond and Surety file should be interfaced with the adjudicative module.

      1) The file should read the operator's name, search the Master Name File for the NID; search the Bond and Surety File for the bond, search Case Recordation (lease) to see if the operator owns an interest in the lease. If yes, (a) the operator should be listed as the principal, the name of the surety should be listed, "operator/lessee" should be listed as the interest in lease, and the type of bond should be displayed. For ease of use, we recommend the bond type be spelled out rather than numerically coded. If no, (b) the bond should be queried for whether it is: (1) an operator's bond, or (2) a statewide or nationwide bond with an operator's bond rider. If the answer is yes, proceed as in (a) above, except list "designated operator" as the interest in the lease.

      2) If the operator is not bonded adequately, Case Recordation (lease) should be searched for the lessee(s). The process should be the same as in 1) above, for each lessee; however, there is no need to search for an operator's bond rider. If the lessee(s) is/are present, they should be listed as in 1)(a). The interest in the lease would be listed as "lessee".

      3) If the lessee is not bonded, the approved holders of operating rights are still authorized to provide bonding. Bureau policy does not provide for the adjudication of operating rights. Since operating rights are not being adjudicated, are all states still entering operating rights in Case Recordation? If not, the system cannot query for ownership and thus continue automation of this process, and manual research of hardcopies would be required.

The solution to this problem is to either: (a) require detailed entry of holders of operating rights with depth, quarter/quarter, section, Township and Range into Case Recordation (lease); or (b) change Bureau policy of allowing the holders of operating rights to provide bonding.

4) If the proposed location is a unit well, the file should search for a unit bond. The data should be displayed as in 1)(a). The interest would be "unit operator".

5) If the answer to steps 1, 2, 3, and 4 is no, a flag should be set to list the bond as a deficiency on the seven-day letter.

c. We recommend that "rights" be changed to "Interest in Lease", i.e., the principal is providing bonding as the designated operator, unit operator, lessee, or approved holder of operating rights. Space for multiple lessees/holders of operating rights should be provided.

d. "Lessee" and "type" should be deleted. The bond rider should be displayed below bond type.

e. A field for Designation of Operator should be added. If the lessee(s) or holders of operating rights are providing bonding rather than the operator, a designation of operator is required. A search of case recordation (lease) should be made for whether a designation of operator for the proposed operator is present, and if the proposed location lies within the area previously designated. If not, a designation of operator is required.

f. A field for "Self-Certification" should be added. If the operator is providing the bonding and no designations of operator are provided, various offices require a statement from the operator that they have the necessary consent from the appropriate lease interest owners to conduct operations on the leasehold. Entry in this field should be optional.

g. The system should search case recordation (lease) for the latest expiration date. The lease expiration date is being calculated by reading the lease issuance date and adding a fixed number of years depending on the type of lease. Leases receive extensions beyond their primary term by drilling, elimination from agreements, etc. The current system does not allow for these extensions.

h. The system currently displays an "X" in the lease held by production field. For ease of use, it should display the type of production, such as actual, allocated, etc.

i. A field for "exploratory or development well" should be added. The type of well control required by the petroleum engineer is dependent on this data. It is also used in the Quarterly Engineering Report. The information should be displayed in the Drilling and Production Module.

j. A field for "drilling extension" should be added. Drilling over the expiration date of the primary term may serve to earn the lease a two-year drilling extension. This will alert the adjudicator of the need for a possible lease extension memo at a later date.

k. A field for "7-day review complete" should be added. The date all adjudicative deficiencies have been determined should be entered and automatically transferred to the 7-day letter file. Once all specialists have completed their reviews and dates appear, the 7-day letter should be automatically generated.

l. A field for "first production memo" should be added. This will alert the adjudicator of the possible need of a first production memo at a later date.

m. A tickler system should be developed to automate the monitoring of the following:

   1) If 7-day letter has not been generated within seven working days after the date of receipt of the APD, a "flag" to the adjudicator should appear.

   2) If the APD filing is not complete within forty-five days after issuance of the 7-day letter, a "flag" to the adjudicator should appear.

IV. Drilling and Production Module

A. Module Design

1. Ease of use. Access into and use of the geology portions of the module are very straight forward and use input forms that should be acceptable to most offices. The engineering portion of the module can be easily understood and operated by a petroleum engineer.

2. Effectiveness. The geologic report as it stands does not provide support for the geologists decisions. Verification of the operators data must be performed manually. It does provide the engineer with the minimum required geologic information for reviewing an APD.

   The D & P module allows an engineer to effectively document his/her review of a drilling application, transmit information to personnel reviewing other aspects of the permit, and generate a useful graphic of the cross section of the wellbore.

3. Efficiency. As the system stands, the geologist manually verifies the operator's data and enters his/her findings. This data is utilized by the engineer in the wellbore diagram. The process minimizes the time necessary for the engineer to research, analyze, and document the technical aspects of an APD.

B. Benefits

The D & P Module will provide numerous benefits for a technical review of an APD. The system transmits information developed by the adjudicator and the geologist to the engineer. This saves time and paper, and prevents a duplication of work. The automated 8 Point Checklist provides a means of tracking the engineering review and generating a 7-day letter.

This module has automated the geologist's report and easily ports the information to the engineer for the generation of the wellbore diagram.

The wellbore graphics portion of the module is an excellent tool. The program allows the engineer to input pertinent technical information from which the computer retrieves libraried data from numerous sources, calculates cement volumes, and generates a wellbore diagram. This minimizes the time an engineer spends looking up values in cementing tables, performing tedious volumetric calculations, and drafting wellbore diagrams.

C. Problems

While the Drilling and Production Module is running smoothly and provides benefits to the technical staff reviewing an APD, it has yet to meet all the specifications identified for this project.

The D & P system as demonstrated does not take advantage of automated capabilities to determine and resolve drilling site conflicts. These capabilities are addressed in the D & P overview but are not addressed in the pseudo-code and are not apparent in the demonstration.

It is unclear whether the geologist should enter the data as submitted by the operator or input his/her values.

The Drilling and Production Overview calls for the ability to draw cross sections of the entire penetrated interval showing:

1. drift (wellbore deviation),
2. casing design,
3. hazardous zones,
4. patented mineral conflicts, and
5. spacing units.

Of these five criteria, only the casing design and the hazardous zones appear on the wellbore diagram.

The bottom hole location has not been incorporated as an element in the database. This is a very important item and is required on all federal drilling applications. This should be input via the adjudicative module where spacing distances are calculated. The bottom-hole location, which does not always coincide with the surface location, is the basis for spacing reviews.

Patented mineral conflicts should also be displayed on the wellbore graphic. This information is pertinent in the review of a cementing program and can effect the correlative rights involved in a drilling prospect.

In many areas, statewide spacing varies with depth, or in a field situation, may vary from pool to pool. The specifications requested that these variances be displayed on the wellbore graphic. However, since the wellbore diagram is a "close-up" representation of the well, the presentation of such spacing boundaries could present a problem in the model's scale. If spacing cannot be displayed on the wellbore graphic, it should be available on the spatial graphic.

D. Recommendations

The Drilling and Production module will assist in a technical review of an APD; however, a few changes and additions will make it even more useful. The following are our recommendations for such additions and changes.

The name of the module, Drilling and Production, is misleading. An APD approval does not address production. We recommend that the name be changed to simply, The Drilling Module.

1. Geology

a. The D & P module requires conflict recognition and resolution capabilities. These capabilities could be developed as a subset of the Mitigation module or as an enhancement to the D & P module. The data as submitted by the operator could be directly entered into the system to be checked for consistency with BLM's data base. If the Mitigation Module was used as the engine for the geologic study it would involve leaving the D & P module, resolving the conflicts, and re-entering the D & P module. Due to the nature of conflicts involved and to provide for future development, an enhancement to the D & P module may be the preferred choice.

As an example of reservoir conflict analysis, known H_2S zones could be spatially represented (similar to a resource boundary). However, the H_2S zones have depth (or formation) as a third dimension. Along the lines of the Mitigation Module, the proposed location could be checked for its proximity or relation to H_2S zones for the total proposed depth of the well. Any found conflicts could be accepted into the geologic report or used to confirm the operator's submittal. Proposed locations near defined boundaries may clue the geologist that a detailed analysis is required.

Similar technology could be applied to verify high pressure, fresh water, geologically hazardous, and other mineral bearing zones.

b. Examination of the proposed formation depths would require either advanced contouring capabilities or geometric evaluation of surrounding wells (known data points). A geometric (3-point) evaluation would provide a reasonable confirmation of the proposed tops, however, contouring and computer assisted drafting (CAD) capabilities could provide for a more accurate evaluation and create an evolving database that could be utilized for other studies (drainage, KGS, etc.).

The creation and update of reservoir information data bases should be given high priority. Proprietary and confidential information will require security measures.

c. The following is a proposed scheme for formations listing (including H_2S, H_2O, mineral zones, etc.) in the D & P geologic module. This scheme includes the surface formation as the first entry. This could provide for an unusually thick representation of the surface formation in the well bore diagram and may warrant a separate data field for surface formation.

Geologically hazardous zones (H_2S, high pressure, etc.) should be flagged on the Special Approval Stipulations document.

FORMATION	MARKER/ MEMBER	DEPTH	FROM	TO	OIL	GAS	H2O	HH2S	PRESS	COAL	URAN	OTHER
SANDY ALLUV.		0										
THIS FM.		5500										
	BED A	5700										
			5650	5700				X				
			5750	5900		X						
THAT FM.		6000										
	MARKER	6225										
			6100	6200			X					
			6250	6300						X		
			6350	6400					X			
OTHER FM.		6500										
			6600	6700							X	
			6800	6900								POTASH

2. Engineering

a. A field should be added for the size of the spacing unit. This value should appear along with the existing spacing information on the Drilling and Production Checklist screen. The field should be automatically filled with edit of spacing files.

b. In November of 1983 (Ref. Onshore Order No. 1), the 10 Point Plan was changed to the 8 Point Plan. The 10 Point Plan header and list on the D & P Checklist should be replaced with the 8 Point Plan.

c. A field for "exploratory or development well" should be added. The type of well control required by the petroleum engineer is dependent on this data. It is also used in the Quarterly Engineering Report. The information should be input via the Adjucative Module and displayed in the Drilling and Production Module.

c. The REQ (required) entry for each point in the 8 Point Plan is unnecessary. All 8 points are required for every federal drilling application. The column would be more useful as a "requested" column. The screen, currently, will not allow an X to be placed in the approved column without an entry in the required column. If the REQ column is to mean requested, this must be changed. Items which are submitted and approved with the original APD should be entered as approved. Only those items which are lacking in the APD should be labeled for a request. When the operator submits the requested data, the REC'D column and the date received column should be completed. Once the information is reviewed and determined adequate, the approved column should be marked.

Inputting a date for every approval is cumbersome. We recommend that the system be programmed to automatically place the current date in the date column whenever an X is placed in the approved column. However, edit capabilities should be available for the date column.

The following is an example of one way the screen might look.

SPACING RULES X — SPECIAL POOL RULES
ORTHODOX LOCATION X — UNORTHODOX LOCATION
SPACING ACREAGE 160 — LOCATION REQUIREMENTS MET X

IS EVERYTHING CORRECT? Y

LOCATION Y 12/28/87 — ELEVATION Y 12/28/87

	REQ	RCD	8 POINT PLAN APR	DATE	COMMENTS
GEOLOGIC TOPS			X	1/1/88	
MINERAL CONTENTS			X	1/1/88	
BOP			X	1/1/88	
CASING PROGRAM			X	1/1/88	
CEMENTING PROGRAM	X	X	X	1/28/88	Appd. surf. casing
MUD PROGRAM	X				Still no mud weight
TESTING	X	X	X	1/28/88	DST Red River
BHP & HAZARDS			X	1/1/88	
OTHER					

8 POINT PLAN REQUIREMENTS MET Y — 7-DAY LETTER Y

d. It is difficult to evaluate the 7-day letter program because it has not been completed. However, we would like to suggest that the points which are marked to be requested on the D & P Checklist are automatically marked as a request on the 7-day letter. Also, it would be beneficial if the 7-Day letter field on the D & P Checklist is automatically filled in when a 7-day letter is generated.

e. The Drilling and Production module allows for only a single grade of casing in the intermediate and production strings. Many operators request approval of a multi-grade casing program. These designs can be incorporated into the D & P module by providing several lines for intermediate and production casing information. The screen would look something like the following:

CASING PROGRAM

	SIZE	GRADE	WEIGHT	HOLE	FROM	TO
SURFACE:	10 1/2	K-55	32	12 1/2	0	700
INTERMEDIATE:	7 7/8	K-55	26	9	0	1000
	7 7/8	K-55	24	9	1000	4000
	7 7/8	K-55	24	9	4000	5000
PRODUCTION:	5 1/2	K-55	15.5	7 7/8	0	2000
	5 1/2	K-55	14	7 7/8	2000	8000
	5 1/2	J-55	15.5	7 7/8	8000	10,000

The cement calculations should incorporate the specifications of the multi-grade casing design.

The information necessary for evaluating a complex casing and cementing program can be automated by purchasing a computer tape of the Halliburton Cementing Tables or the like. This source would provide a complete set of wellbore capacity statistics, casing specifications, and cementing information used in the technical review of an APD. These tables would replace the existing casing tables with a more complete data source. Furthermore, this information could provide the engineer with the casing strength values used to determine if the proposed casing design meets minimum safety standards. The values include collapse strength (collapse resistance, psi), burst strength (internal yield pressure, psi), and tensile strength (joint strength, 100 lbs).

f. Finally, we recommend that a remarks section, similar to that in the geology section, should be available for the engineer. This would be most appropriate following the 8 Point Checklist screen.

g. The engineers casing program (in particular the surface casing) should be automatically checked against the geologist report to assure that fresh water and other pertinent zones are protected. This check should be in the form of a trigger indicating when the casing depths and the pertinent zone depths do not agree. Any discrepancies should also appear and be highlighted in the well bore diagram. These problems should be resolved between the engineer and geologist before approval.

h. The resolution of the wellbore (WB) diagram may present problems. As an example, a thin important aquifer (10 feet) may not be visible in a 10,000 foot well. The WB diagram may need enlargement or zoom capabilities to show some of these zones. The WB diagram, and perhaps all graphics, should have computer aided drafting (CAD) capabilities (or be able to easily down- and upload into CAD software). CAD will allow for the professional to represent or highlight certain parameters and ideas that are not automatically represented. The ability to move postings and text will avoid clutter in the diagram.

V. Remaining Modules - Fluid Surface Management, Mitigation, and Consolidation

It should be noted that during this evaluation the specifications for these modules were not completed and were unavailable for "hands-on" demonstration. Comments on these modules are somewhat subjective and based on the written specifications. Since a demonstration model was not available, it is likely that some elements of the system were overlooked. Further review of a demonstration model may be necessary for a more objective and complete evaluation.

A. Anticipated Module Design

1. Screen 1 (APD Status List)

This screen appears to be a logical starting point to begin surface management reviews. User specifications appear to be simple and easy to perform.

2. Screen 2 (Surface Requirements and Concurrences Checklist - Thirteen-Point Plan)

Even though some surface protection specialists do not use a checklist in performing their duties, the use of a list is an effective and recommended way to document the review process. The list appears to be adequate and adaptable to individual office needs. Ease of use does not appear to be a problem. However, there are a number of instructions to complete the screen. Without a demonstration model to work with, it is difficult to judge problems with user "interface."

3. Screen 3 and 3A (Graphic Display of Well Location, Road Network, etc.)

Screen 3 should prove an effective way to graphically display and document established boundaries, proposed access roads and ancillary facilities. Hopefully, user interface will be simple, especially when digitizing proposed roads and ancillary facilities. Use of a demonstration model is probably the best way to determine ease of use and design efficiency of these screens.

4. Screen 4 (Conflict Analysis)

This screen appears to provide a very effective method to document potential surface-related conflicts. Identifying potential conflicts is certainly an integral and necessary part of the APD review process. Here again, the user interface and design efficiency cannot be adequately evaluated until a demonstration model is developed.

5. Screen 5 (Graphic Display of Conflicts for Mitigation)

   Screen 5 should be an effective tool to graphically display conflicts for further evaluation. Screen use appears to be simple and efficient.

6. Screen 6 (Conflict Analysis Review for Mitigation)

   It would seem logical that a status screen needs to be developed to identify resources needing further conflict evaluation. The ease of using the screen by resource specialists and the design efficiency still need "hands-on" demonstration.

7. Screen 7 (Conflict Analysis Review of Proposed Action)

   It appears that this screen is simply a recall of screen 5. However, recall of specific data seems to be available to the resource specialist here that is not available in the other screen. This may be helpful in doing a more complete resource analysis. Unfortunately, user interface and design efficiency cannot be evaluated at this time without a demonstration model.

8. Screen 8 (Conflict Analysis Review of Proposed Action with Master Resource and Interactive Screen Digitizing)

   The opportunity to edit the master resource file should be very effective in maintaining an accurate file for other APD conflict analysis. User interface and design efficiency need further evaluation.

9. Consolidation (Screen 1 - and Form Packets)

   This screen should be simple to use and effective in generating clearance and approval forms. Provided the demonstration model confirms that the forms can be easily retrieved and completed, this module is seen as a very effective tool in consolidating information for final APD approval.

B. Anticipated Benefits

Benefits can best be divided into two separate parts: first, the Fluids Surface Management Module, and second, the Mitigation and Consolidation Modules. The perceived benefits of the Fluids Surface Management Module (the first five screens) are as follows:

1. This module provides a method whereby surface use conflicts can be quickly identified. No longer will the Natural Resource Specialist (Surface Compliance Specialist) have to research maps and mylar overlays and inquire from individual specialists if a conflict exists. Specific conflicts can be identified immediately, which should allow the specialist more time to do on-site inspections and resolve specific conflicts.

2. Documentation through use of checklists and graphic displays should help provide better evidence for National Environmental Policy Act (NEPA) analysis and decisions.

3. By transcribing locations of new well locations, access roads, and pipelines into a permanent spatial data file, the data file is automatically maintained or updated. This should eliminate the need to transfer the information to either a cartographic technician or a clerk who manually updates a paper copy.

4. The emphasis of keeping the spatial data files current should help build an individual's confidence in the data.

Perceived benefits of the Mitigation and Consolidation Modules (which include the remaining screens) are as follows:

1. A primary benefit of these modules is that they provide spatial and/or graphic data files for many resources. Instead of a resource specialist maintaining maps at his desk or querying another computer information system, he can now extract information from one system, update the data file, and generate mitigation measures. Provided that the system design proves to be user friendly, this benefit should help eliminate some paperwork flow, generate mitigation measures in a timely fashion, and provide for more time to do outside inspections and inventories.

2. As previously mentioned, the emphasis in these modules to keep the spatial and graphic data files current should help build the resource specialist's confidence in the data.

3. The consolidation files should provide a very convenient system to store, retrieve, and/or complete appropriate clearance and approval documents. This should result in time savings for document preparation.

C. Anticipated Problems

It is difficult to anticipate all the problems within the Fluid Surface Management, Mitigation, and Consolidation modules until the demonstration model is actually on line. However, the following are some potential problems that could occur unless some changes are made in the demonstration specifications.

1. The use of security codes provides a good method to control modifications in the master resource data files and to designate what specialist can perform specific reviews. However, program specifications must be flexible enough to allow BLM differences in delegated responsibilities. For example, specifications in the consolidation module indicate that the drilling and production specialist is the final clearing entity before the APD is ready for Area Manager's signature. This may not be the case in all offices and the demonstration model should provide for programming flexibility in this matter.

2. If one screen could be used to capture deficiencies and/or conflicts from selected status screens in the different modules, it could facilitate filling out the 7-day letter and provide an easy status review when industry inquiries are made The module specifications do not seem to provide for this.

3. Even though existing and needed rights-of-way (ROW) can be identified through use of screens 2 and 3, the Fluids Surface Management module does not allow for further processing of the APD related ROW. Rights-of-way for access roads and pipelines can be an integral part of APD approvals. (See Washington Instruction Memorandum No. 87-349) Without some changes in module specifications, a very important action for APD approval may be overlooked in this demonstration project.

D. Recommendations

1. To assure that this demonstration project is successful, it is recommended that the remaining modules be developed to the point of demonstration and be analyzed by another "user" group prior to field demonstration. This will help guarantee that all elements of the Fluids Surface Management, Mitigation, and Consolidation Modules have been addressed and function properly. User acceptance of this automated approach for APD approvals can only be enhanced.

2. Develop within the Fluid Surface Management Module, a screen for APD rights-of-way. In some states processing APD related rights-of-way is the rule and not the exception. By developing a screen for these actions, the demonstration model will be enhanced and will provide more credibility to the APD approval process.

3. Insure that the use of security codes within the module design is flexible. Specifications should point out that security codes are discretionary and dependent upon management decisions at each field office. By providing this latitude, the demonstration model can be easily adopted by different District and Area office organizations.

4. Develop on one of the adjudication/status screens a place where APD deficiencies and conflicts from all the modules can be shown. This will provide a one stop review when inquiries from industry are received. It could also facilitate filling out the 7-day letter.

VI. Other Observations

Numerous concerns have been identified by the team that are beyond the scope of our evaluation, but are significant enough that we felt we should raise them so that they can be addressed elsewhere by the Bureau as appropriate.

A. Concerns for the Technical Team

1. Technical support. As the team used the demonstration system and problems arose, it was very handy to have a flock of programmers at our elbow to help resolve them. When we encountered a screen that we felt should be changed to accommodate a different APD processing approach, we were told to consult with our "systems administrator" to have the changes made. As we all know, virtually no one in the Bureau who processes APDs has a Systems Administrator or even knows what one is. This issue of the availability of technical support is a question that needs to be looked at by the technical evaluation team and, for the long term, by the BLM as a whole.

2. Costs. Throughout this document, we've tried to identify the benefits apparent to the user of this automated APD process. Costs, however, have not been addressed. Clearly, the upfront costs of designing and developing this system for a demonstration have been high, and can not be considered costs of developing the APD modules alone. The processes and specifications used to develop this demonstration system shall be fine tuned, used and amortized in future systems development. However, the technical team and BLM management must make a stab at determining whether the long-term benefits accrued are worth the costs incurred.

B. Ideas for Future Steps in the Automation Process

1. Development of advanced reservoir management capabilities would allow the utilization of data bases and digital maps in other reservoir modules (drainage, KGS).

2. During the evaluation process, the potential for additional automation of subsequent well activity became evident. One concern is the tracking of bonding liability. The APD System shows the ability to begin this process. The principal and surety liable at the time of approval is already in place. By building an automated Individual Well Record (IWR) System and "dumping" the data currently in the APD System, the potential for linkage of the system to case recordation could allow for the automatic update of this information as subsequent assignments and operators are approved.

3. An additional observation made was the potential advantages of linking the APD System to other automated systems. We have assumed throughout this evaluation that these modules would not be a "closed" system, ie. that opportunities would be provided to exit the system and work on other data or analytical systems or to export data to other systems as needed.

It is critical to eventually view these modules as only a part of the overall Land Information System being developed by the Bureau, and to provide links via the data base management system to other related systems. The most obvious example associated with APD processing is to link to the PC-based Automated Inspection Record System (AIRS), and to provide for the automatic transfer of data to that system.

Another example is the increasing emphasis in the Drainage program that may require links between drainage tracking systems (usually in dBase III) and this APD system. When an offset well is required for drainage protection it must specifically test the interval being drained. The Drilling Module should indicate on the wellbore diagram the zones to be tested and these test requirements should also be placed in the Special Approval Stipulations.

4. No linkage is evident to alphanumeric resources data bases that may be useful in the Fluid Surface Management module, only spatial resources data. As we work toward constructing a Land Information System, we can't forget that automated resource data includes both spatial and alphanumeric information. Where these data bases reside and how they are accessed must be considered carefully by resource system developers now, so that they can be integrated into LIS in the future.

5. For the proposed system to benefit the Resources and Mineral programs, the professional staffs may have to shift their emphasis to development and maintenance of the required digital data bases. The specialists' time savings realized by the streamlined system could be shifted to this data base workload. The professional staffs control or influence on the data will be required to instill confidence in the system and acceptance of the results. As such, serious consideration must be given to how and when to initially compile these data bases (particularly reservoir information). This type of work will require a large time commitment of the professional staff. With the target system proposed for 1993 and following years planning and perhaps initial development of these digital data bases using current GIS technology should begin well before the target date. The ultimate goal of such a parallel endeavor would be for the required data bases to be developed and maintenance routines established when the target system becomes operational. Failure to do so will result in a fully operational system with no reliable data to work with.

   An alternative would be to contract out the initial data collection and digitizing, thereafter requiring the data to be maintained by the professional staff. Traditional flow of information may have to be changed to provide staff members with the data required for this maintenance.